CS10- Beef and policy coherence for sustainable development

MATS Deliverable 3.3

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Introduction

The MATS project aims to expand and enhance the available knowledge on the relationships between agricultural markets, trade, investments, policy, environmental sustainability, human well-being, and hence the SDGs. It intends to set a new benchmark in agricultural trade policy analysis to deliver novel solutions for the necessary sustainability transition. The EU Green Deal, as an example of a policy programme that aims at improving sustainability, represents both a challenge and an opportunity for agrifood imports for all countries, in differentiated ways. To turn this opportunity into reality the improvement of the design, governance, and implementation of trade policies and regimes are required all the way from private sector to national, EU, African and global levels.

As the core part of the MATS project, an integrated modelling framework was developed and applied to seven case studies. The impact of unsustainable practices, as well as the multidimensional gains emerging from improved sustainability have been identified and quantified. The results provide guidance for assessing the impact of sustainable agricultural trade policy at local, national, regional and global level, across a range of social, economic and environmental indicators.

CS10 – Beef (EU, Africa, South America)[1]

The issue analysed is the sustainability of beef production and the potential role of current and upcoming policies to increase sustainability both on the production and consumption side. The methodology used for the creation of the Causal Loop Diagram (CLD) is called Systems Thinking (see Text Box 1). A CLD is a graphical representation of variables and their interconnections, giving shape to the dynamics of a given system (see Text Box 2).

The CLD is presented in Figure 1 and Figure 2, and was created as a team effort (Research Centre on Animal Production & KnowlEdge SRL), founded on co-creation (with a step by step, participatory approach).

Several factors determine the potential to grow, as well as constraints for the beef production sector. These are underlying the presence of reinforcing feedback loops, or dynamic that stimulate change (e.g. an increase in cost competitiveness results in the growth of farms and in the creation of economies of scale, which further increase cost competitiveness), and balancing feedback

[1] https://sustainable-agri-trade.eu/beef-and-policy-coherence-for-sustainable-development/

loops in the system, or dynamics that counter (oppose) change (e.g. constraints on land availability may result in higher costs, a factor that reduced costs competitiveness and curbs the growth potential of farms), as described as follows.

At the beginning of the CLD creation process, we have analysed the dynamics that determine the farm size, which then affects the cost of production. The farm size has been historically impacted by access to capital, which then allows to reduce the cost of production and increase cost competitiveness, resulting in the further growth of farm size (R1). A growing farm size also influences labor intensity (declining) and the number of animals (increasing). Access to capital also influences technology adoption, which affects labor intensity (reducing it). As a result, employment is impacted both by labor intensity (affected by farm size and technology adoption) and by the number of animals. With higher employment come higher labor costs (both due to the total number of employees and the skill level of employees), showing that labor costs are pushed higher by increased skills (R3), but also pushed lower by reduced labor intensity (B1).

We have then explored the implications of the growth of farm size that has occurred historically. On the one hand, it generates a lock-in effect (with farms becoming bigger and bigger, underlying the dominance of reinforcing loops, via an improvement of cost competitiveness, R2), on the other hand it leads to higher production, economic activity and revenues. This, together with the reduced cost achieved via economies of scale and technology adoption, results in higher profitability, and hence higher access to capital (as a combination of R1, R2 and R3).

This being considered, constraints also emerged. The higher is production, the lower is beef price (if supply is larger than demand). This would generate a balancing dynamic, that would reduce profitability and the expansion of farms (unless export potential allows to further increase production without affecting local dynamics), but possibly trigger an increase in demand for beef (B5). Further, on the environmental side, higher production results in (i) higher land requirements, feed production, which may face higher costs is land availability is constrained (B3); (ii) higher manure generation, causing an increase in nutrient concentration per hectare, and (iii) higher GHG emissions. National and international legislation may limit production when excessive amounts nutrients and emissions are produced (e.g. measured in terms of emissions productivity per ton of meat produced). In the same way, consumer preferences have, in certain instances, shifted to low emission, animal welfare certified products. These emerging dynamics would reduce demand (if sustainability is not addressed, B4) or increase demand, including for export (if sustainability concerns are addressed, R5).

Several intervention options were identified that could support investments in sustainability for beef production. Within sector operations, the adoption of technology (via access to capital) would increase productivity, reducing nutrient concentration and GHG emissions. Lobby groups, animal welfare legislation, and consumer attention could trigger efforts towards labelling of the sustainability of beef, stimulating affecting exports, and beef demand overall. This intervention would generate positive returns for investments in improved sustainability, a factor that is currently -for the most part- an intangible benefit.

Concluding, it was assessed that, product sustainability through both improved production practices, animal welfare, land use (e.g. avoided deforestation) and GHG emission reduction can positively impact beef prices (with a premium being applied to sustainable products) and boost export to premium markets. National legislations, lobby groups, and consumer attention can support the internalization of intangible benefits, e.g. via product labelling, payments for ecosystem services, generating a stream of revenues that it is in line with sustainability goals. At the same time, higher profitability and investments in technology can also improve wages, generating a mutually reinforcing synergy between economic, social and environmental performance.

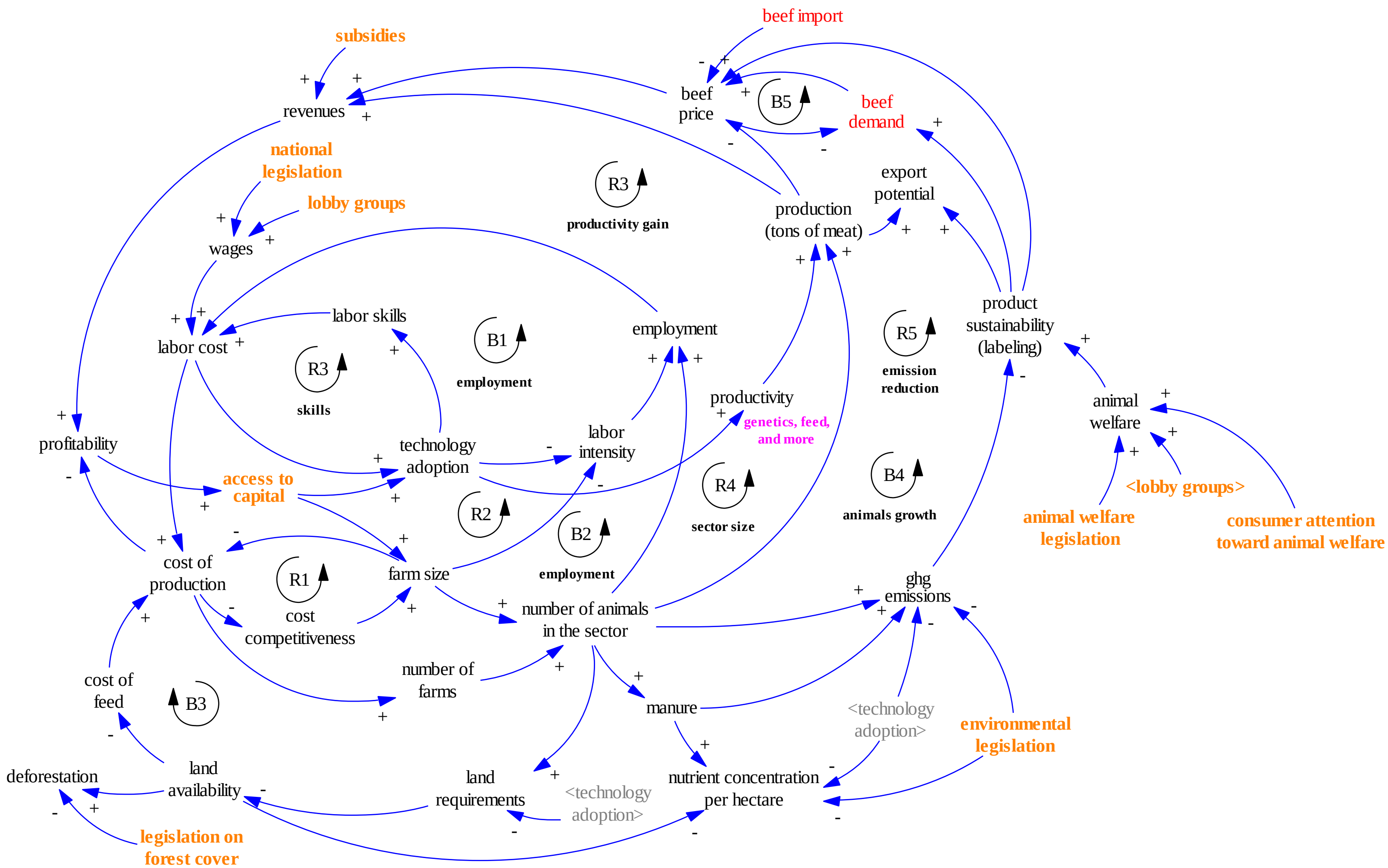

Figure 1. CLD for the dynamics influencing beef production.

Legend: Red variables (external factors), Orange variables (policy options).

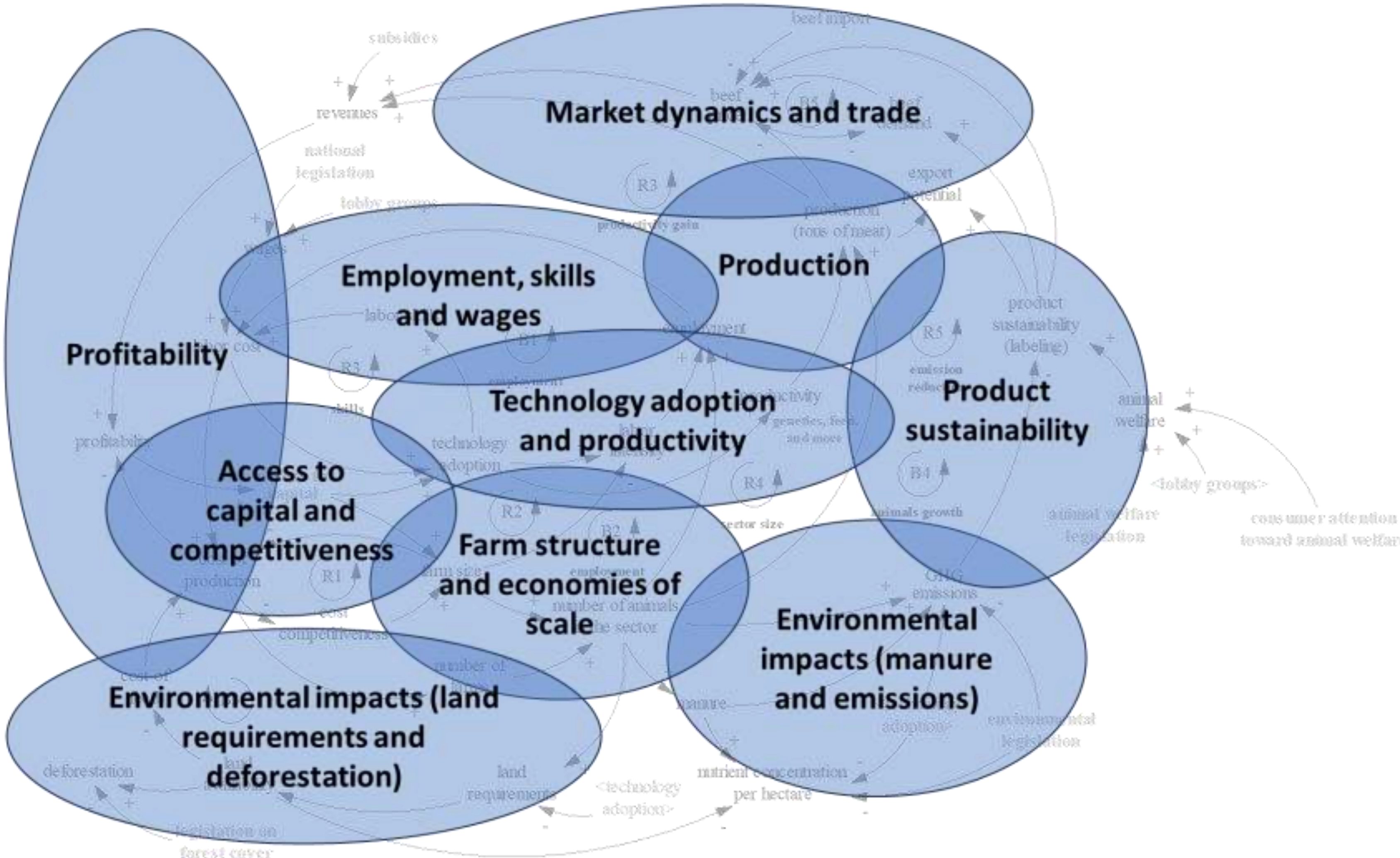

Figure 2. CLD and key thematic areas for beef production

Text box 1: Introduction to Systems Thinking

Systems Thinking (ST) is an approach that allows us to better understand and forecast the outcomes of our decisions, across sectors, economic actors, over time and in space (Probst & Bassi, 2014). It emphasizes the system, being made of several interconnected parts, rather than focusing on its individual parts.

With ST being an approach, there are several methodologies and tools that support its implementation and hence the identification of the underlying functioning mechanisms of a system and their quantification and evolution over time. In general terms, it can be said that the identification of the components of a system and of the relationships existing among these components (e.g. carried out through the use of Causal Loop Diagrams) represents (i) the *soft* side of Systems Theory. Instead, attempts to quantify these linkages and forecast how their strength might change over time (e.g. carried out using System Dynamics models) represent (ii) the *hard* side of the field.

Concerning the former (i), Causal Loop Diagrams (CLD) allow to create a shared understanding of how the system works, and hence identify effective entry points for (human) intervention, such as public policies. When this is done using a participatory approach, it helps to bring people together, creating the required building blocks for the co-creation of a shared and effective theory of change.

On the latter (ii), System Dynamic models allow to quantify policy outcomes across social, economic and environmental indicators (UNEP, 2014) providing insights on the relative strength of various drivers of change (scenario analysis) and supporting the identification and prioritization of policy intervention (policy analysis). These models can be bottom up or top down (Probst & Bassi, 2014).

In the context of this research, the role of ST is to assess the extent to which the main drivers of change considered (i.e. ageing of population, technological change and fiscal sustainability) can shape future trends, affect existing policy effectiveness and require future interventions. This in turn allows to identify a system's safe operating space and limits, anticipating the emergence of side effects, across social, economic and environmental indicators.

Text box 2: Causal Loop Diagrams (CLD)

A causal loop diagram (CLD) is a map of the system analysed, or, better, a way to explore and represent the interconnections between the key indicators in the analysed sector or system (Probst & Bassi, 2014). As indicated by John Sterman, "*A causal diagram consists of variables connected by arrows denoting the causal influences among the variables. The important feedback loops are also identified in the diagram. Variables are related by causal links, shown by arrows. Link polarities describe the structure of the system. They do not describe the behavior of the variables. That is, they describe what would happen if there were a change. They do not describe what actually happens. Rather, it tells you what would happen if the variable were to change.*" (Sterman, 2000)

As indicated by Sterman, CLDs include variables and arrows (called causal links), with the latter linking the variables together with a sign (either + or −) on each link, indicating a positive or negative causal relation (see Table 1). A causal link from variable A to variable B is positive if a change in A produces a change in B in the same direction. A causal link from variable A to variable B is negative if a change in A produces a change in B in the opposite direction. Circular causal relations between variables form causal, or feedback, loops. There are two types of feedback loops: reinforcing and balancing. The former can be found when an intervention in the system triggers other changes that amplify the effect of that intervention, thus reinforcing it (Forrester, 2002). The latter, balancing loops, tend towards a goal or equilibrium, balancing the forces in the system (Forrester, 2002).

By highlighting the drivers and impacts of the issue to be addressed and by mapping the causal relationships between the key indicators, CLDs support the identification of policy outcomes using a systemic approach (Probst & Bassi, 2014). CLDs can be in fact be used to create storylines corresponding to the implementation of policy interventions, by highlighting direct, indirect and induced policy outcomes across social, economic and environmental indicators.

Variable A	Variable B	Sign
↑	↑	+
↓	↓	+
↑	↓	-
↓	↑	-

Table 1. Causal relations and polarity

References

Forrester, J. (2002). *Road Maps: A guide to learning System Dynamics.* Camebridge: Systen Dynamics Group, Sloan School of Management, MIT.

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